

REMARKS

This case has been carefully reviewed in light of Office Action dated 1 May 2006. Claims 13-16 have been canceled, claims 1, 6, 9, 10 and 12 have been amended, and claims 1-12 remain pending. Applicant respectfully requests reconsideration of the application by the Examiner in light of the following remarks below.

Objections

Applicant thanks the Examiner for noting the typing error in paragraph [0024] and has amended that paragraph to correct the typing error.

Applicant also thanks the Examiner for noting that the reference number in FIG. 3 did not match that of paragraph [0026]. Applicant has amended paragraph [0026] to match the designation of FIG. 3.

Claims 6, 9, 10 and 12 were objected for certain informalities. Applicant respectfully submits that claims 6, 9, 10 and 12 have been amended to correct the informalities pointed out by the Examiner.

Applicant respectfully requests the Examiner withdraw the objections to the Specification, Drawings, and Claims in light of the amendments.

35 USC 112

Claims 1-9 and 15 were rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter. Claim 15 has been canceled.

With respect to base claim 1, Applicant has amended claim 1 to recite the receiving and modulating aspects which are discussed in more detail below.

With respect to claim 5, Applicant respectfully submits that claim 1 has now been amended to include proper antecedent basis for the recitations in claim 5.

Accordingly, Applicant respectfully requests the Examiner to withdraw the rejection of claims 1-9 under 35 USC 112.

Double Patenting

Claims 13-16 were objected to under 37 CFR 1.75 as being a substantial duplicate of claims 2 and 4-6. Applicant has canceled these claims.

35 USC 102 and 103

Group I

Claims 1, 6, and 8 were rejected under 35 USC 102(b) as being anticipated by Riza US5718226, and claim 7 was rejected under 35 USC 103(a) as being unpatentable over Riza and further in view of Sliwa US5560362. Applicant respectfully traverses these rejections and submits Riza does not teach, suggest or disclose each and every element of independent claim 1, particularly as amended.

Claim 1 recites (with emphasis added):

1. An ultrasound system comprising:
an ultrasound probe comprising a plurality of **transducer elements configured for sensing ultrasound signals and converting the ultrasound signals to analog electrical signals**, the ultrasound probe configured for transmitting the analog electrical signals; and
an optical conduit comprising an electro-optic modulator configured for
 - (a) receiving the analog electrical signals,
 - (b) receiving optical signals from a light source, and
 - (c) **modulating the optical signals with the analog electrical signals**;

wherein the optical conduit is configured for transmitting the modulated optical signals to an optical detector.

Riza does not teach, suggest or disclose receiving the analog electrical signals, receiving optical signals from a light source, and modulating the optical signals with the analog electrical signals. Riza's system is particularly directed to ultrasound systems with wave division multiplexing (WDM). Riza modulates wave division multiplexed light with received ultrasound energy and then transmits the multiple wavelength light to a WDM photonic beamformer. The ultrasound system of Riza does not appear to be configured to modulate optical signals with the analog electrical signals received from the probe. The ultrasound system of Riza is adapted for use in systems where there exists a wave division multiplexing of the received ultrasound energy and light (column 5, lines 25-42). Hence, Riza does not teach, suggest or disclose modulating the optical signals with the analog electrical signals of claim 1.

Claim 7 was rejected under 35 USC 103(a) as being unpatentable over Riza and further in view of Sliwa. Claim 7 depends from claim 1 which Applicant believes to be in condition for

allowance over Riza for the reasons discussed above regardless of whether Sliwa might be interpreted to teach or suggest Cooling lines. Accordingly, Applicant respectfully submits that claim 7 define allowable subject matter over Riza and Sliwa.

Accordingly, Applicant respectfully submits that claim 1, and claims 6, 7, and 8 which depend therefrom, define allowable subject matter over the applied art. Withdrawal of the rejections is respectfully requested.

Group II

Claims 1 and 10-12 were rejected under 35 USC 103(a) as being unpatentable over Callahan US5949491 and Akimoto US4739521; Claims 1 and 10-11 were rejected under 35 USC 103(a) as being unpatentable over Wood US5715823 alone or further in view of McMorrow US6569097 and further in view of Groezinger US6101407; and Claims 1 and 8-10 were rejected under 35 USC 103(a) as being unpatentable over Kitney US5081993 in view of Hamilton US5010346 alone or further in view of Shoop US529150.

Callahan and Akimoto (Claims 1 and 10-12)

As discussed above, amended claim 1 recites (a) receiving the analog electrical signals, (b) receiving optical signals from a light source, and (c) modulating the optical signals with the analog electrical signals. Amended claim 10 recites (with emphasis added):

10. A method for generating an image, the method comprising:
sensing ultrasound signals,
converting the ultrasound signals to analog electrical signals;
receiving optical signals from a light source;
modulating the optical signals with the analog electrical signals to generate a corresponding plurality of optically modulated analog signals;
converting the plurality of optically modulated analog signals to a corresponding plurality of digital signals; and
processing the plurality of digital signals to generate the image.

Callahan does not teach or suggest receiving optical signals from a light source and modulating the optical signals with the analog electrical signals. Callahan instead describes an image management system that can be used in conjunction with an ultrasound system. Applicant has reviewed column 4, lines 37-53 of Callahan (cited by the Examiner), but it appears that Callahan merely discusses a method by which the scan signals can be converted a two dimensional digital image. Nowhere does Callahan teach, suggest, or discloses modulating optical signals with analog electrical signals from an ultrasound probe as claimed in Applicant's independent claims 1 and 10.

Akimoto does not overcome the deficiencies of Callahan. Akimoto is also directed to an imaging apparatus used for generating an image. Akimoto describes an electro-optic converting device, but this device is merely used between a video signal converting circuit and a display unit. Thus, the electro-optic converter of Akimoto is not configured to modulate optical signals with the analog electrical signals but instead is used to convert the video signal to an optical format.

Accordingly, Applicant respectfully submits that claim 1, claim 10, and claims 11-12, which depend therefrom, define allowable subject matter over the Callahan and Akimoto.

Wood, McMorrow, and Groezinger (claims 1 and 10-11)

Wood, McMorrow and Groezinger are all directed to ultrasound systems where the generated ultrasound data can be accessed remotely through the World Wide Web. Wood, McMorrow and Groezinger neither alone or in combination teach, suggest nor disclose receiving optical signals from a light source and modulating the optical signals with analog electrical signals from an ultrasound probe as recited in claims 1 and 10. Further, these references do not teach or suggest, with respect to claim 1, transmitting the modulated optical signals over the optical conduit to an optical detector.

Accordingly, Applicant respectfully submits that claim 1, claim 10, and claim 11 which depends therefrom, define allowable subject matter over Wood, McMorrow and Groezinger.

Kitney, Hamilton and Shoop (claims 1 and 8-10)

Kitney, Hamilton, and Shoop are all directed to analog to digital converters used in conjunction with electro-optic converters and do not, either alone or in combination, teach, suggest, or disclose an optical conduit comprising an electro-optic modulator for modulating the optical signals with the analog electrical signals. Clearly, the electro-optic modulators disclosed by Kitney, Hamilton, and Shoop all function as A/D converters, which is the opposite of what independent claims 1 and 10 recite. Claims 1 and 10 teach and disclose modulating optical signals with *analog* electrical signals. Kitney, Hamilton and Shoop describe generating modulated *digital* signals.

Accordingly, Applicant respectfully submits that claim 1, claim 8 which depends therefrom, and claim 10, define allowable subject matter over Kitney, Hamilton and Shoop.

Group III

Examiner Grouping labeled "Cordless ultrasound Probe Heads"

Claims 1, 6, and 10-12 were rejected under 35 USC 103(a) as being unpatentable over Hwang US6142946 in view of Jago US6890301; and claim 6 was rejected under 35 USC 103(a) as being unpatentable over Hwang in view of Jago and further in view of Bartelt EP0762142A1.

Both Hwang and Jago are directed to wirelessly transmitting data from the ultrasound probe head to the ultrasound system. The Examiner states that it would have been obvious in view of Jago to use an optical link to transmit the ultrasound data to the system. However, nowhere do either Hwang or Jago (or any combination of the two references) teach, suggest or disclose modulating optical signals with analog electric signals. Both Hwang and Jago instead teach transmitting digital signals wirelessly to an ultrasound system for further processing.

Accordingly, Applicant respectfully submits that claim 1, claim 6 which depends therefrom, claim 10, and claims 11-12 which depend therefrom, define allowable subject matter over Hwang and Jago.

Claim 6 depends from claim 1 which Applicant believes to be in condition for allowance over Hwang and Jago for the reasons discussed above regardless of whether Bartelt might be interpreted to teach or suggest demultiplexers. Accordingly, Applicant respectfully submits that claim 6 defines allowable subject matter over Hwang, Jago, and further Bartelt.

Examiner grouping labeled "Prior GE-Assigned Optic Transducer Technology"

Applicant notes the Examiner suggestion that Applicant review all documentation associated with prosecution of the references listed by the Examiner in this sub-grouping. Because Yakmyshyn and Duggal do not appear to teach or suggest the recitations of Applicant's claims, Applicant does not believe that obtaining such files is necessary to meet Applicant's Rule 56 Duty to Disclose.

Claims 1 and 8 were rejected under 35 USC 102(b) as being anticipated by Yakmyshyn US5353262 or Duggal US5532981.

Yakmyshyn appears to describe a transducer assembly including a transducer housing and a signal laser mounted on the housing. The optical frequency generated by the signal laser is modulatable in correspondence with the acoustic energy incident on the transducer assembly (column 4, lines 1-17). Thus, the signal laser in Yakmyshyn is used for *acoustic-optical conversion*

and *not* used for generating analog electrical signals for use in *electrical to optical modulation* as recited in Applicant's independent claim 1. In other words, Yakmyshyn appears to have a transducer for directly using acoustic energy to modulate an optical signal whereas Applicant has a transducer to convert an ultrasound signal to an analog electrical signal and a modulator that uses the analog electrical signal to modulate an optical signal.

Duggal appears to describe using optical fibers to communicate the output signal from each pixel to the signal processing assembly. The frequency modulation of the laser output caused by the acoustic disturbance is converted into amplitude modulation (column 5, lines 20-42). Thus, in Duggal as well, the system is configured for *acoustic-optical conversion* and is not used for modulating optical signals with analog electrical signals as recited in Applicant's independent claim 1.

Accordingly, Applicant respectfully submits that claim 1 and claim 8 which depends therefrom define allowable subject matter over Yakmyshyn and Duggal.

Claims 2-3 and 13 were rejected under 35 USC 103(a) as being unpatentable over Yakmyshyn or Duggal and further in view of Smith US6476541 alone or further in view of Allen US4923288 or Yakmyshyn US5396362; Claims 4 and 14 were rejected under 35 USC 103(a) as being unpatentable over Yakmyshyn or Duggal and Smith alone or further in view of Allen or Yakmyshyn, and further in view of Liu US6248069; Claims 5-6 were rejected under 35 U.S.C §103(a) as being unpatentable over Yakmyshyn or Duggal and Smith alone or further in view of Allen or Yakmyshyn, and further in view of Kitney or Bartelt; Claim 7 is rejected under 35 USC 103(a) as being unpatentable over Yakmyshyn or Duggal, and further in view of Sliwa; and Claim 9 is rejected under 35 U.S.C §103(a) as being unpatentable over Yakmyshyn or Duggal, and further in view of Tiemann US5565867.

Claims 13 and 14 have been canceled. The other claims rejected under this section all depend directly or indirectly from independent claim 1 which Applicant believes to be in condition for allowance over Yakmyshyn and Duggal for the reasons discussed above. Applicant respectfully submits that the dependent claims define allowable subject both by virtue of their dependency from an allowable base claim as well as for the subject matter they separately recite.

Claims 10-11 were rejected under 35 USC 103(a) as obvious based upon Yakmyshyn US5739936 in view of Kitney.

As discussed with respect to claim 1, Yakmyshyn is not believed to describe modulating

optical signals with analog electrical signals. Instead, acousto-optical conversion is used. Kitney, as discussed with reference to the Group II rejection, relates to modulating digital signals. Thus, it is not clear how the two references could be combined in a manner to teach or suggest Applicant's claim 10. Accordingly, Applicant respectfully submits that claim 10 and claim 11 which depends therefrom define allowable subject matter over Yakmyshyn and Kitney.

Claim 12 is rejected under 35 U.S.C §103(a) as being unpatentable over Yakmyshyn in view of Kitney, and further in view of Liu; Claim 15 is rejected under 35 U.S.C §103(a) as being unpatentable over Yakmyshyn or Duggal and Smith alone or further in view of Allen or Yakmyshyn, and further in view of Kitney or Bartelt; Claim 16 is rejected under 35 U.S.C §103(a) as being unpatentable over Yakmyshyn or Duggal and Smith alone or further in view of Allen or Yakmyshyn, and further in view of Kitney or Bartelt.

Claims 15 and 16 have been cancelled. Claim 12 depends from independent claim 10 which Applicant believes to be in condition for allowance over Yakmyshyn and Kitney for the reasons discussed above. Applicant respectfully submits that claim 12 defines allowable subject both by virtue of its dependency from an allowable base regardless of whether Liu relates to amplification.

Summary

Applicant respectfully requests that a timely Notice of Allowance be issued in this case. Should the Examiner believe that anything further is needed to place the application in better condition for allowance, the Examiner is requested to contact Applicant's undersigned representative at the telephone number below.

Respectfully submitted,

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